ABOUT THESE MAPS

Maps a, b and c show the at-sea density (birds/km^2) of Fork-tailed Storm-Petrel (*Oceanodrama furcata*) in three ocean seasons - Upwelling, Oceanic, and Davidson Current, displayed in cells of 5' latitude by 5' longitude. Densities are based on the combined data sets of several studies; see the Data and Analyses section of this chapter. The color and mapping intervals were selected to show the most structure and highlight significant areas, while allowing comparisons among marine bird species. Cells that were surveyed but in which no Fork-tailed Storm-petrels were observed have a density of zero. Areas not surveyed appear white; no information was available for these areas. Blue lines indicate the boundaries of the National Marine Sanctuaries in the study area: Cordell Bank, Gulf of the Farallones and Monterey Bay. Bathymetric contours for the 200 m and 2,000 m isobaths are shown in light blue.

In order to provide an integrated look at the patterns of a species' spatial and temporal occurrence and abundance in the study area, map d shows seasonal high-use areas, displayed in cells of 10' latitude by 10' longitude, and also breeding colonies (when available). The seasonal high use map provides a further synthesis of densities presented in maps a, b and c, and portrays the relative importance of various areas to the species. Areas with consistently high use are highlighted. See the Data and Analyses section of this chapter for further explanation of high-use areas. Because the sighting data for this species extends significantly beyond the western extent of the standard map frame used in this project, additional maps are provided for this species in Appendix 3B that include a greater western extent.

DATA SOURCES AND METHODS

The at-sea data set is referred to as the CDAS central California data set (1980-2001) and was developed using software called Marine Mammal and Seabird Computer Data Analysis System (CDAS), by the R.G. Ford Consulting Co. The data set extends from Pt. Arena to Pt. Sal in the study area, and the surveys used were conducted between 1980 and 2001. See the Data and Analyses section of this chapter for more information on the at-sea survey data sets and methods.

RESULTS AND DISCUSSION

The Fork-tailed Storm-Petrel is uncommon in the study area and is on California's "Species of Special Concern" list (McChesney *et al.,* in press a); the species was infrequent in the study area until the cool water period of 1999-2002. Surveys in CDAS recorded 326 sightings of 674 individuals.

Fork-tailed Storm-Petrels typically occupied waters over the outer continental slope and beyond (mean depth water 2,509 ± 78 m); thus, only very low densities occurred within the National Marine Sanctuary boundaries. The Farallon Escarpment was an important area of concentration. A multiple regression model of nine independent variables explained only 9.2% of the variation in cell density, and the top three variables for this species were ENSO period, season and ocean depth; see Table 3.8. These results reflect this species' peak abundances during La Niña, when an influx of this species into central California occurred. In the study area, densities were highest in 1985, 1991, 1995-96, and 1999, with all but 1995-96 being years of La Niña.

Looking at the longer-term trends, there appeared to be an increase in abundance toward the end of the study period in conjunction with a cold-water period (1999-2002), and a seasonal component was also apparent in this. Specifically, during the warm-water period of 1976-1998, this species was more abundant during the Davidson Current Season, but thereafter, the abundance peak shifted to the Upwelling Season. Overall, the species was most concentrated during the Upwelling Season, and occurred within the study area in all three ocean seasons.

Fork-tailed Storm-Petrels feed on invertebrates and larval fish found at the surface. See Tables 3.5, 3.8, 3.8, 3.10 and 3.11 for related summary information.